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## तिपहिया साइकिल, हाथचालित — विशिष्टि

( पहला पुनरीक्षण )

## Tricycle, Hand Propelled — Specification

( First Revision )

ICS 11.180.10; 43.150

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भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS  
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI-110002  
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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Artificial Limbs, Rehabilitation Appliances and Equipment for Persons with Disability, Sectional Committee and approval by the Medical Equipment and Hospital Planning Division Council.

This standard was first published in 1976. The first amendment was issued in 1984 and second amendment was issued in 2012. The first revision of this standard has been taken up to update it with the latest development taken place in the field. All the above amendments issued so far have been incorporated in this revision.

As the hand propelled tricycle are to be used by invalids having different stature and with varied form of disabilities of lower extremities, all the dimensions cannot be fixed. Therefore, keeping in view not to restrict the improvements in design and at the same time to ensure interchangeability of replaceable components, only the essential dimensions have been specified.

In the preparation of this standard, the Sectional Committee concerned has kept in view the manufacturing and trade practices followed in the country in this field.

This standard contains clauses which permit the purchaser to use his option for selection to suit his requirements. The relevant clause are **6.7, 6.12, and 6.13**. The clauses **7.1** and **10** call for an agreement between the purchaser and the supplier.

Salient modifications made in this revision are as follow:

On gaining the experience in the field the following modifications have been made in this revision:

- a) Provision of 'Bicycle rim tapes and buckles' as per **IS960 : 2005** in place of 'cotton webbing, proofed and unproofed' according to **IS 7298 : 1973**;
- b) Provision of 'expanded vinyl coated fabrics' as per **IS 8698 : 1984** in place of 'vinyl coated fabrics' as per **IS 1259 : 1984**;
- c) Tolerance on the following dimensions have been modified:
  - 1) Overall length from 10 mm to 50 mm;
  - 2) Overall width from 10 mm to 25 mm; and
  - 3) Overall height from 10 mm to 25 mm.
- d) Clearance of foot rest from ground to be modified from  $120 \pm 10$  mm to  $145 \pm 25$  mm;
- e) Fig. 1 have also been modified to make use of other shape of Structural steel tube in addition of round shape;
- f) Minimum thickness of seat and back rest have been modified as 8 mm to have better strength;
- g) Diameter of wire use to made steel stay of mudguard has been modified as 4 mm minimum in place of 4.8 mm and minimum clearance between the wheel and fork has been modified as 8 mm in place of 10 mm;
- h) Designation of drive chain has been modified as 081 in place of 083;
- j) Dimension of tubes used for frame have not been specified, Sizes use shall satisfy tests specifies in the standard;
- k) All the Indian Standards cross-referred in this revision have been updated; and
- l) All the amendments issued before revision have been incorporated.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with **IS 2 : 1960 'Rules for rounding off numerical values (revised)**. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

*Indian Standard*

# TRICYCLE, HAND PROPELLED — SPECIFICATION

*(First Revision)*

## 1 SCOPE

This Standard specifies the overall dimensions and functional requirements for hand propelled tricycle used as conveyance by invalids having disability of lower extremities. It does not include power driven tricycle.

## 2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
277 : 2018	Galvanized steel sheets (plain and corrugated) — Specification ( <i>seventh revision</i> )	1068 : 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium — Specification ( <i>third revision</i> )
287 : 1993	Permissible moisture content for timber used for different purposes recommendations ( <i>third revision</i> )	1131 : 2006	Bicycle bottom bracket axle — Specification ( <i>third revision</i> )
303 : 1989	Plywood for general purposes — Specification ( <i>third revision</i> )	1132 : 2009	Bicycle — Bottom bracket ball cups — Specification ( <i>third revision</i> )
399 : 1963	Classification of commercial timbers and their zonal distribution ( <i>first revision</i> )	1134 : 2004	Bicycles bottom bracket lock ring — Specification ( <i>third revision</i> )
401 : 2001	Preservation of timber — Code of practice ( <i>fourth revision</i> )	1331 : 1971	Specification for cut sizes of timber ( <i>second revision</i> )
513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purposes ( <i>sixth revision</i> )	1573 : 1986	Specification for electroplated coatings of zinc on iron and steel ( <i>second revision</i> )
624 : 2003	Bicycles — Rims — Specification ( <i>fourth revision</i> )	2039 : 1991	Steel tubes for bicycle and cycle rickshaws — Specification ( <i>second revision</i> )
630 : 2005	Bicycle spokes (plain) and nipples for spokes — Specification ( <i>third revision</i> )	2403 : 2014	Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets ( <i>third revision</i> )
737 : 2008	Wrought aluminium and aluminium alloy sheet and strip for general engineering purposes — Specification ( <i>fourth revision</i> )	2414 : 2005	Cycle and rickshaw pneumatic tyres — Specification ( <i>fourth revision</i> )
960 : 2005	Bicycle rim tapes and buckles — Specification ( <i>second revision</i> )	2415 : 2015	Cycle — Rubber tubes (moulded/jointed) — Specification ( <i>fourth revision</i> )
		2898 : 1976	Specification for steel balls For Rolling Bearings ( <i>first revision</i> )
		4454 (Part 1) : 2001	Steel wire for mechanical springs: Part 1 Cold drawn unalloyed steel wire Specification ( <i>third revision</i> )
		6307 : 1985	Specification for rigid PVC sheets ( <i>first revision</i> )
		6799 : 1987	Specification for padlocks, bicycle ( <i>first revision</i> )
		8698 : 1984	Specification for expanded vinyl coated fabrics ( <i>first revision</i> )
		16305 : 2017	Cycles — Glossary of terms used in the bicycle industry

### 3 NOMENCLATURE

For the purpose of this standard, the nomenclature of various parts are as given in Fig. 1 and IS 16305 : 2017 shall apply.

### 4 SHAPE AND DIMENSIONS

**4.1** The typical shape and dimensions of the hand propelled tricycle shall be as shown in Fig. 1 and Table 1.

**Table 1 Dimensions of Tricycle, Hand Propelled (Right/Left)**

Sl No.	Nomenclature	Size (in mm)
(1)	(2)	(3)
i)	Overall length	1960 ± 50
ii)	Overall width	890 ± 25
iii)	Overall height	990 ± 25
iv)	Width of foot rest	320 ± 10
v)	Length of foot rest	600 ± 10
vi)	Clearance of foot rest from ground	145 ± 25
vii)	Arm rest height from seat	225 ± 10
viii)	Seat length	600 ± 10
ix)	Seat width	430 ± 10
x)	Back height from seat	320 ± 10
xi)	Length of steering handle	420 ± 10
xii)	Height of rear wheel supporting frame	385 ± 10
xiii)	Leverage of steering handle	5:1

## 5 MATERIAL

### 5.1 Tubing

The tube used in the frame work of tricycle shall conform to ERW (C1 or C2 or C3) quality specified in IS 2039 : 1991.

### 5.2 Standard Tricycle Components

Standard components used in the fabrication of tricycle shall be made to the relevant Indian standards on bicycle components. List of relevant Indian Standards on bicycle components is given at Annex A.

### 5.3 Seat and Back Rest

#### 5.3.1 Seat

Seat shall have plywood base of minimum 8 mm thickness conforming to IS 303 : 1989 or shall have base of wooden planks of not less than 10 mm thickness mounted on a wooden frame or shall have sheet metal base having minimum 1.0 mm thickness suitably formed.

The seat made from any of the above method shall be padded with foam rubber cushioning or other equally suitable material and covered with suitable expanded vinyl coated fabrics conforming to IS 8698 : 1984.

#### 5.3.2 Back Rest

Back Rest shall have plywood support of minimum 3 mm thickness mounted on a wooden frame and the rear side of the back rest shall be covered with plywood of minimum 3 mm thickness or back rest shall have plywood base of minimum 8 mm. thickness confirming to IS 303 : 1989 or shall have sheet metal support having 1.0 mm minimum thickness suitably formed.

Back rest made from any of the above method shall be padded with foam rubber cushioning or other equally suitable material and covered with suitable expanded vinyl coated fabrics conforming to IS 8698 : 1984.

### 5.4 Footrest, Seat Walls and Tool Box

#### 5.4.1 Foot Rest

Shall be made from mild steel sheet, Type – Ordinary, Designation GP, Grade O, conforming to IS 277 : 2018 having a thickness 2 mm or Mild Steel CR1 Sheet thickness 2 mm confirming IS 513 (Part 1) : 2016 or mild steel chequered sheet of minimum thickness of 2 mm. excluding raised portion or Aluminium Alloy sheet of 2.0 mm thickness conforming to designation 31000 or 31500 of IS 737 : 2008 or from rigid PVC of thickness 3 mm have strength conforming to IS 6307 : 1985.

#### 5.4.2 Seat Walls

Shall be made from mild steel sheet, Type – Ordinary, Designation GP, Grade O, conforming to IS 277 : 2018 having a thickness 1.25 mm or mild steel CR 1 sheet conforming to Grade ‘O’ IS 513 (Part 1) : 2016 having a 1.0 mm thickness or from suitable plastic material having a minimum 3 mm thickness.

#### 5.4.3 Tool Box

Shall be made from mild steel sheet, Type – Ordinary, Designation GP, Grade O, conforming to IS 277 : 2018 having a thickness 0.50 mm or Mild Steel CR 1 Sheet Thickness 0.3mm confirming IS 513 (Part 1) : 2016.

#### NOTES

**1** Tool box shall be treated as optional accessories to between the purchaser and the supplier.

**2** Tolerance on the thickness will apply as per the relevant Indian Standards.

### 5.5 Spring Wire

Spring wire used in the brake assembly shall conform to IS 4454 (Part 1) : 2001.

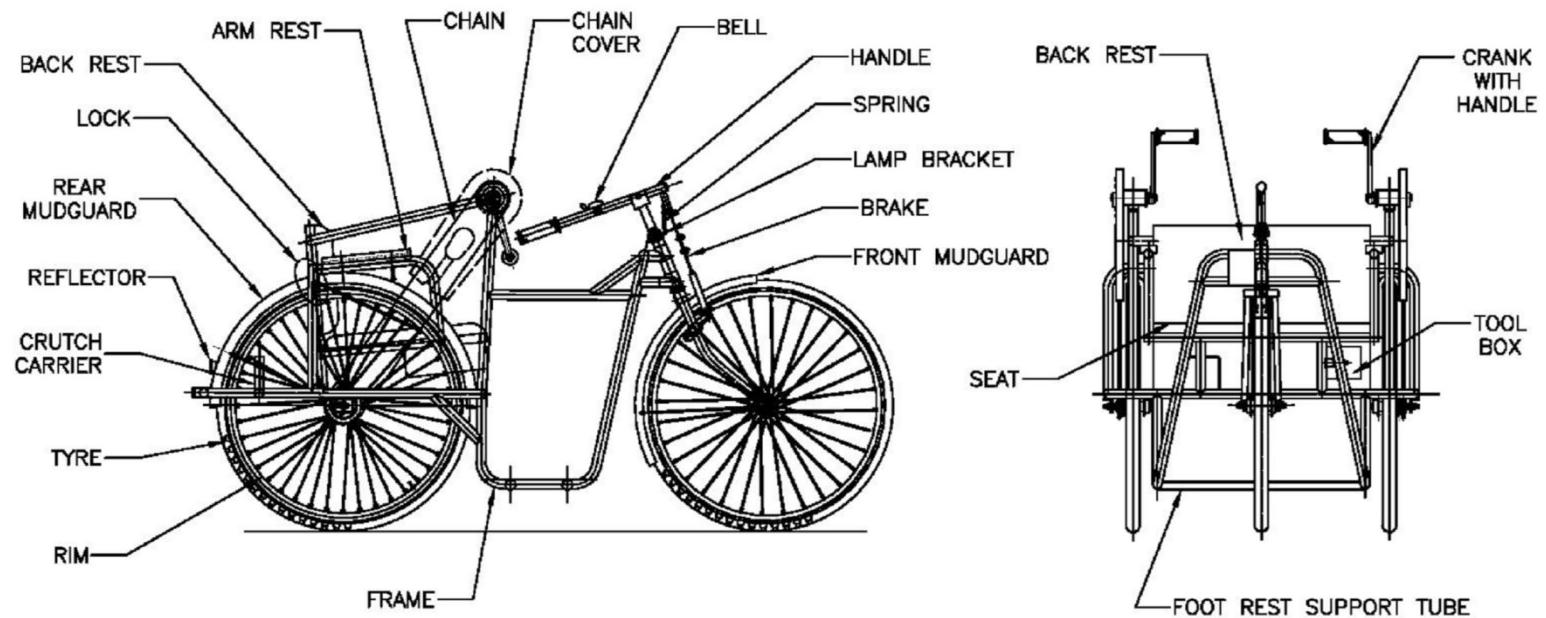


FIG. 1 TRICYCLE, HAND PROPELLED, TYPICAL

**5.6 All other metallic components shall be of mild steel.**

#### **5.7 Timber**

Timber for seat frame and other parts shall be seasoned heart wood of any of species of timbers specified for furniture and cabinet making in IS 399 : 1963. Heart wood of non-durable timbers and sapwood, if present, shall be given a suitable treatment in accordance with IS 401 : 2001. Timber used shall be free from prohibited defects and it shall have not more than the permissible defects as prescribed in IS 1331 : 1971 for Grade I timber for non-structural use. Permissible moisture content in timber shall be as recommended in IS 287 : 1983.

#### **5.8 Bearing Balls**

The ball bearing shall conform to Grade 200 of IS 2898 : 1976.

### **6 REQUIREMENTS**

#### **6.1 Frame**

The frame shall be made from steel tubing. Confirming to ERW (C1 or C2 or C3) quality specified in IS 2039 : 1991. The end portion of the tubes shall be radius cropped and shall be joined by welding/brazing. The frame assembly shall be sound and of robust construction. There shall be no sharp edges or unsealed formations.

#### **6.2 Steering Handle Bar**

The steering handle bar shall be of lever type, fitted to the head tube and it shall be of such length as can be conveniently held by the driver without drooping ahead. The handle shall be light to manoeuvre and it shall have a suitable plastic or rubber hand grip at its holding end to facilitate proper gripping. It shall be pivoted at 5:1 length towards the other end which shall have a toggle joint for connecting with the front brakes.

#### **6.3 Tyres and Tubes**

Tyres and tubes used shall be 28" × 1½" (40 – 635) size heavy duty type (Type A) conforming to IS 2414 : 2005 while tubes shall conform to IS 2415 : 2015.

#### **6.4 Wheel Rims**

Wheel rims for the tricycle shall be Beaded edge (BE) type, Size 28" × 1½" Designation BE-635-25-Steel conforming to IS 624 : 2003. They shall be free from pitting or uneven plating. Spoke - holes shall be properly punched or drilled. The spokes shall be of 2.0 mm nominal diameter and shall conform to IS 630 : 2005.

There shall be 32 spokes in the front wheel and 40 holes in each of the rear wheels. When assembled, the spokes shall cross each other. A rim tape of 12 mm wide conforming to IS 960 : 2005 shall be wrapped

around the rim, over riveting of spokes, to protect the tube being damaged by heads of spokes.

#### **6.5 Mudguards**

They shall be made from mild steel sheets, properly formed ‘open type’ with beaded edges. The front mudguards shall be provided with a steel stay made from minimum 4 mm diameter wire. It shall extend 150 mm beyond the forks whereas the rear mudguard shall extend below the wheel stay on each side. A clearance of not less than 25 mm shall be provided between mudguard and the tyres and a clearance of minimum 8 mm between the wheel and fork shall be given. The mudguards shall be free from dents and other defects.

#### **6.6 Brakes**

Usual brakes shall be provided to the front wheel of the tricycle which shall be capable of applying by pressing the steering handle bar downwards. However, if required by the purchaser, brakes may be provided to each of the rear wheel too, with suitable means of applying brakes to both the wheels simultaneously. Brakes shall be effective and light to operate.

#### **6.7 Sprocket and Free Wheel**

The tricycle shall be provided with one set of sprocket of 22 or 18 teeth and free wheel of 22 or 18 teeth on each side as per agreement between seller and purchaser.

The sprocket welded integral with a hub shall be mounted along with a crank of 175 mm length (centre to centre) on an axle which shall rest in the bottom bracket on two ball cup bearings (*see* IS 1131 : 2006, IS 1132 : 2009 and IS 1134 : 2004). The height of the bottom bracket shall be so kept that while cranking, maximum height of elbow does not go above the level of the shoulder.

#### **6.8 Front Wheel Hub**

Front wheel hub assembly shall be standard unit, with each end of the hub provided with cup and cone type ball bearings. Bearings and races shall be hardened and polished. Provision shall be made for adjustment of the front wheel bearing assembly and positive locking after adjustment.

#### **6.9 Rear Wheel Hub**

Rear wheel hub assembly shall be standard unit and shall be mounted on the axle by means of cup and cone type ball bearings provided at each end of the hub. Bearings shall be hardened and ground. Provision for adjustment of the bearing shall be integral to the assembly and positive locking after adjustment shall be made.

#### **6.10 Drive Chain**

Drive chain shall conform to designation 081 of IS 2403 : 2014.

## **6.11 Chain Cover**

Each of the two drive chains shall be provided with chain covers suitably mounted so as to give adequate protection to the operator and his clothing from contact with drive sprocket and drive chain. The drive chain shall not touch the chain cover at any place during operation.

## **6.12 Armrests**

The armrests at its two sides if agreed between seller and purchaser shall be properly built so as to provide maximum comfort to the person driving the tricycle. The armrests shall not interfere the arms while cranking. The armrests shall be provided with adequate foam rubber padding all over on top if so required by the purchaser.

## **6.13 Tool Box**

A tool-cum-accessories box with suitable means for locking shall be provided below the seat. This shall be optional if required by the purchaser.

## **6.14 Lock**

A cycle lock conforming to IS 6799 : 6799 or any other suitable locking arrangement shall be provided on any one of the rear wheels, to prevent the movement of tricycle when not in use.

## **6.15 Hood**

If required by the purchaser, a suitable hood may be provided to the tricycle for protection against sun and rain. The hood shall be folding type and attached firmly to the tricycle in a manner convenient for the user to fold and unfold it.

## **6.16 Lubrication**

All moving parts of the equipment normally requiring lubrication shall be provided with means for such lubrication.

**6.17 Suitable means shall be provided on the underside of the tricycle for keeping the crutches or walking stick securely and conveniently.**

## **6.18 Accessories**

The following items shall be furnished as accessories:

- a) Horn or bell;
- b) Red reflector on each mudguard at the rear;
- c) Set of tools – optional;
- d) Rear-view mirror – optional; and
- e) If required by purchaser, a head light assembly, hand pump and one red reflector on the front side mudguard.'

## **6.19 Servicing and Adjustment**

Prior to the delivery of the tricycle, the supplier shall service and adjust each tricycle for operational use,

including at least the following:

- a) Adjustment of braking system;
- b) Alignment of wheels;
- c) Inflation of tyres and complete lubrication of operating mechanisms; and
- d) Handicapped sign to be prominently displayed at the front and the back.

## **7 FINISH**

**7.1** The frame of the tricycle, steering handle bar and mudguards, prior to assembly, shall be thoroughly cleaned by suitable means to remove rust, scale and oily substances. These shall be then chemically rust-proofed and stove-enamelled, spray-painted or otherwise finished to give a glossy finish. The colour of the finish shall be as agreed to between the purchaser and the supplier.

**7.2** All the metallic parts other than those mentioned in **7.1** shall have a smooth finish and shall be plated chromium oven nickel in accordance with Service Grade No. 3 of IS 1068 : 1993 or shall be plated zinc in accordance with Grade 1 of IS 1573 : 1986 specification for electroplated coatings zinc on iron and steel.

## **8 TESTS**

### **8.1 Road Test**

Each tricycle shall be road tested by riding with a load of 1 kN at foot rest to a minimum distance of 1.5 km at speed of 8 to 10 km/h. Travel shall include, but not be limited to, level unimproved roads for testing. All the components as well as the tricycle shall be intact and no part shall be loosened on completion of the test.

### **8.2 Manoeuvrability**

The tricycle shall be operated at moderate speed and shall turn and steer without difficulty of operation, structural or component failure.

### **8.3 Static Load Test**

The tricycle selected for static load test shall be loaded as follows:

Place 50 kg weight at steering handle end, 50 kg at each of the crank handles, 100 kg at the foot rest and 200 kg at the seat. The tricycle shall be subjected to this 450 kg load for not less than 15 min. There shall be no damage after the test.

### **8.4 Brake Test**

**8.4.1** The tricycle selected shall be tested for stopping ability while travelling down on 8percent dry hard surface gradient at 15 km/h and it shall stop within a distance of 10 m. It shall be capable of braking to full stop from a speed of 15 km/h within 8 m on a

dry hard surface level road, free from loose dirt and gravel.

**8.4.2** The brake shall be further tested for holding ability while descending a 200 m and 5percent gradient. The brake shall be able to maintain a constant speed within 3 km/h without overheating.

#### **8.5 Test for Finish**

A solid steel ball of 13 mm diameter shall be dropped from a height of 1.5 m on any painted surface of the tricycle. The paint at the place where the steel ball strikes shall stand the impact without showing any sign of tear or peeling off.

### **9 MARKING**

**9.1** The tricycle shall be marked by putting a label or otherwise with the following:

- a) Manufacturer's name, initials or recognized trademark;

- b) Batch No. and date of manufacture; and
- c) Any special information regarding design or intended use.

#### **9.2 BIS Certification Marking**

The tricycle may also be marked with the Standard Mark.

**9.2.1** The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

### **10 PACKING**

The packing shall be done as agreed to between the purchaser and the supplier.

**ANNEX A**

( Clause 5.2 )

**RELEVANT INDIAN STANDARDS ON BICYCLE COMPONENTS**

<i>IS No.</i>	<i>Title</i>
532 : 2006	Bicycle tube valves and valve-tubing — Specification ( <i>third revision</i> )
624 : 2003	Bicycle rims — Specification ( <i>fourth revision</i> )
629 : 2013	Bicycle — Hub assemblies — Specification ( <i>third revision</i> )
630 : 2005	Bicycle spokes plain and nipples for spokes — Specification ( <i>third revision</i> )
960 : 2005	Bicycle rim tapes and buckles — Specification ( <i>second revision</i> )
1131 : 2006	Bicycle bottom bracket axle — Specification ( <i>third revision</i> )
1132 : 2009	Bicycle — Bottom bracket adjustable ball cup (PH Type) ( <i>third revision</i> )
1281 : 2014	Bicycle — Cranks and chain wheels — Specification ( <i>third revision</i> )
1282 : 2018	Bicycle cotter pins, washers and nuts ( <i>second revision</i> )
1283 : 1995	Bicycle — Free-wheels — Specification ( <i>second revision</i> )
2061 : 1995	Bicycle — Front forks — Specification ( <i>first revision</i> )
2415 : 2015	Cycle — Rubber tubes moulded jointed — Specification ( <i>fourth revision</i> )
2973 : 2017	Bicycle — Steering head assembly — Specification ( <i>second revision</i> )

**ANNEX B**( *Foreword* )**COMMITTEE COMPOSITION**

Artificial Limbs, Rehabilitation Appliances and Equipment for the Disabled, Sectional Committee, MHD 09

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All India Institute of Medical Sciences, New Delhi	DR SANJAY WADHWA ( <b>Chairman</b> )
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Jamia Millia Islamia (Department of TTNFE), New Delhi	PROF SARA BEGUM
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National Institute for the Empowerment of Persons with Visual, Dehradun	SHRI MANISH VERMA SHRI CHAND PRAKASH THAPA
National Institute for the Orthopaedically Handicapped, Kolkatta	DR A. BISWAS PRASANNA KR. LENKA ( <i>Alternate</i> )
National Institute for the Visually Handicapped, Dehradun	SHRI MANISH VERMA SHRI CHAND PRAKASH THAPA
National Society for the Prevention of Blindness- India, New Delhi	SHRI DR S. K. NAIR SHRI DR RAJIV MOHAN ( <i>Alternate</i> )
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Patna Medical College, Patna	DR PROF AJIT KUMAR VARMA DR VINOD PRASAD ( <i>Alternate</i> )

<i>Organisation</i>	<i>Representative(s)</i>
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BIS Directorate General	SHRI PRAKASH BACHANI, SCIENTIST 'E' AND HEAD (MHD) [REPRESENTING DIRECTOR GENERAL ( <i>Ex-Officio</i> )]

*Member Secretary*

SHRI PRAKASH BACHANI  
SCIENTIST 'E' AND HEAD (MHD), BIS





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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: MHD 09 (11649).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones: 2323 0131, 2323 3375, 2323 9402

Website: [www.bis.gov.in](http://www.bis.gov.in)

### Regional Offices:

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	{ 265 0206 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892
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